US009157320B2

(12) **United States Patent**
Lehnert et al.

(10) **Patent No.: US 9,157,320 B2**
(45) **Date of Patent: Oct. 13, 2015**

(54) **TOOL FOR REMOVING A CHISEL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/611,735**

(22) Filed: **Sep. 12, 2012**

(65) **Prior Publication Data**

US 2013/0000090 A1 Jan. 3, 2013

Related U.S. Application Data

(63) Continuation of application No. 13/449,651, filed on Apr. 18, 2012, now Pat. No. 8,286,316, which is a continuation of application No. 12/454,708, filed on May 21, 2009, now Pat. No. 8,181,322.

(30) **Foreign Application Priority Data**

May 26, 2008 (DE) 10 2008 025 071

(51) **Int. Cl.**

B23P 19/04	(2006.01)
E21C 35/19	(2006.01)
E21C 35/18	(2006.01)

(52) **U.S. Cl.**

CPC ***E21C 35/19*** (2013.01); *E21C 2035/1826* (2013.01); *Y10T 29/49822* (2015.01); *Y10T 29/5383* (2015.01); *Y10T 29/53704* (2015.01); *Y10T 29/53909* (2015.01)

(58) **Field of Classification Search**

USPC 29/252, 253, 255, 270, 278, 243.5, 29/243.56, 243.53, 243.523, 243.529

See application file for complete search history.

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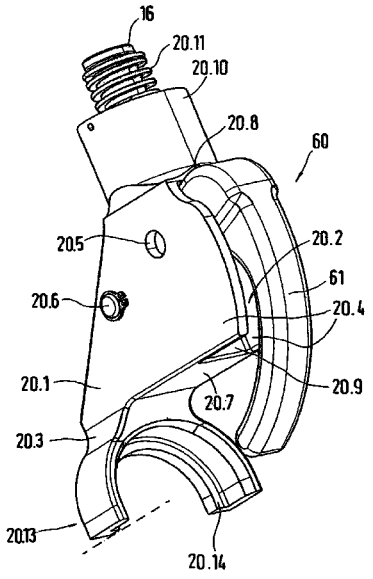
(57) **ABSTRACT**

A tool for removing a chisel, in particular from a chisel holder, having a base element which receives an actuating member, wherein the actuating member has an expeller mandrel. The actuating member is adjustable along a displacement direction. In order to be able to perform the removal simply and rapidly, the actuating member of this invention is indirectly or directly coupled to a piston of a fluid-charged cylinder, or to an electric motor unit.

20 Claims, 8 Drawing Sheets



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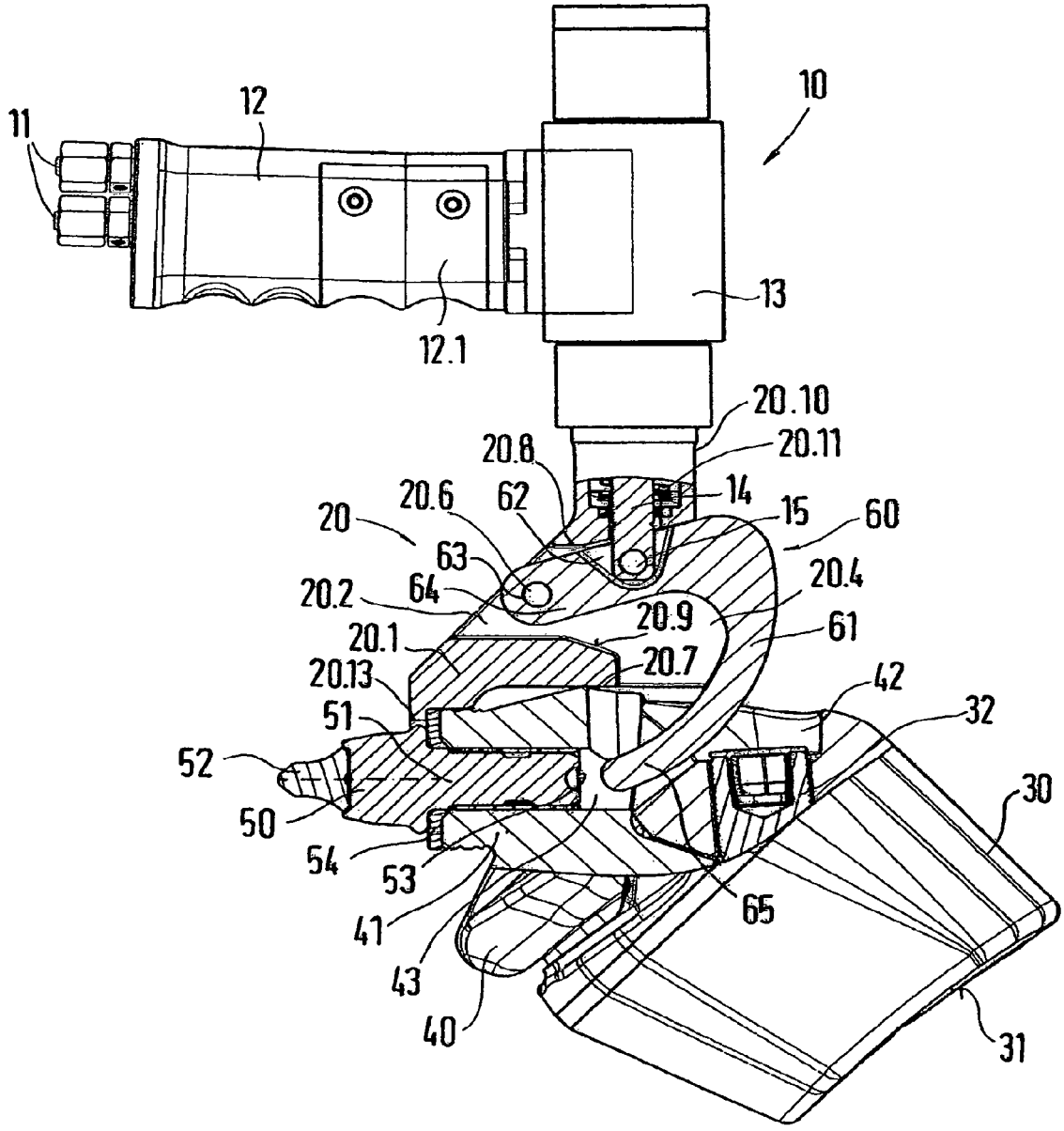
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Fig.1

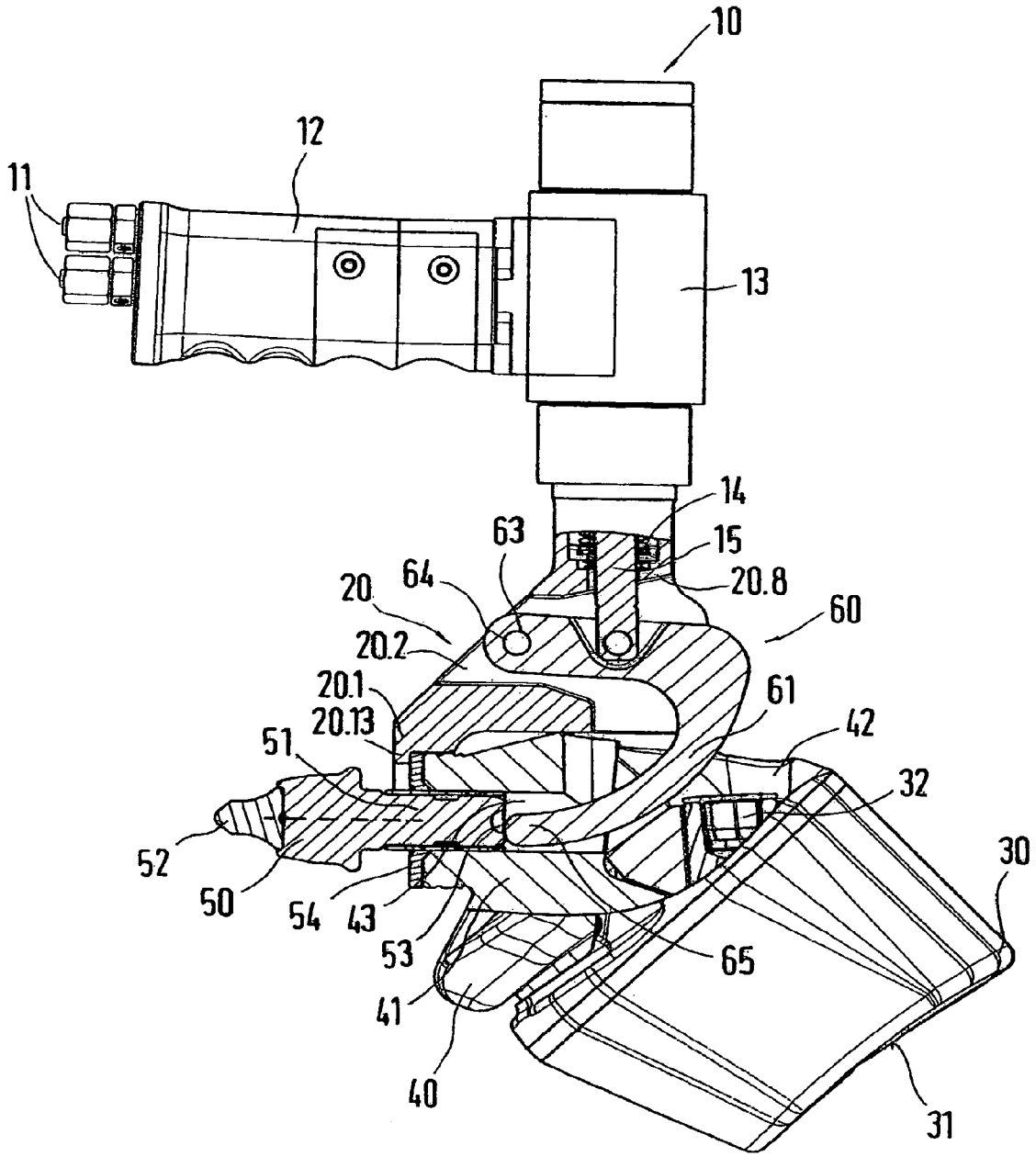
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Fig.2

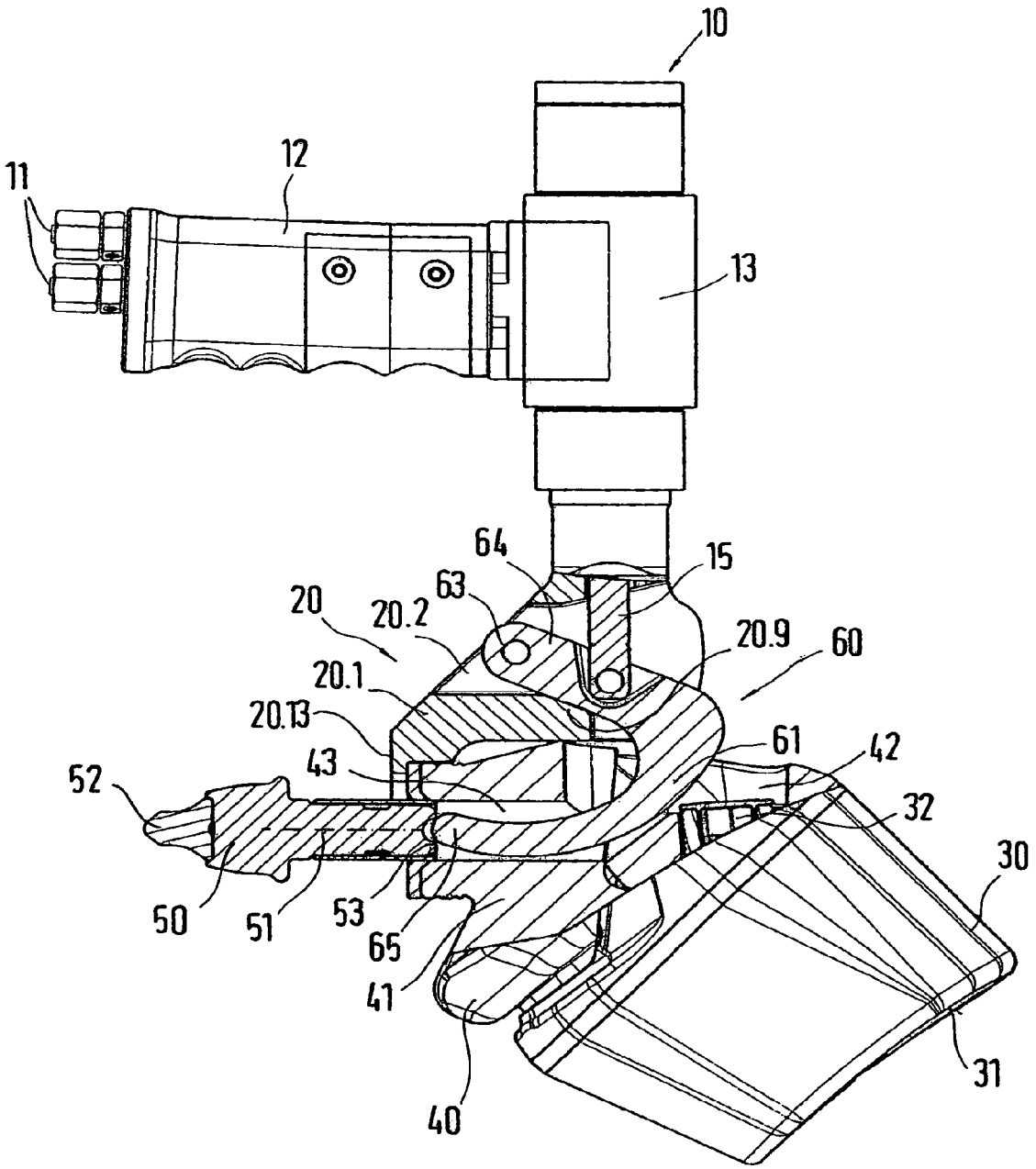
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Fig.3

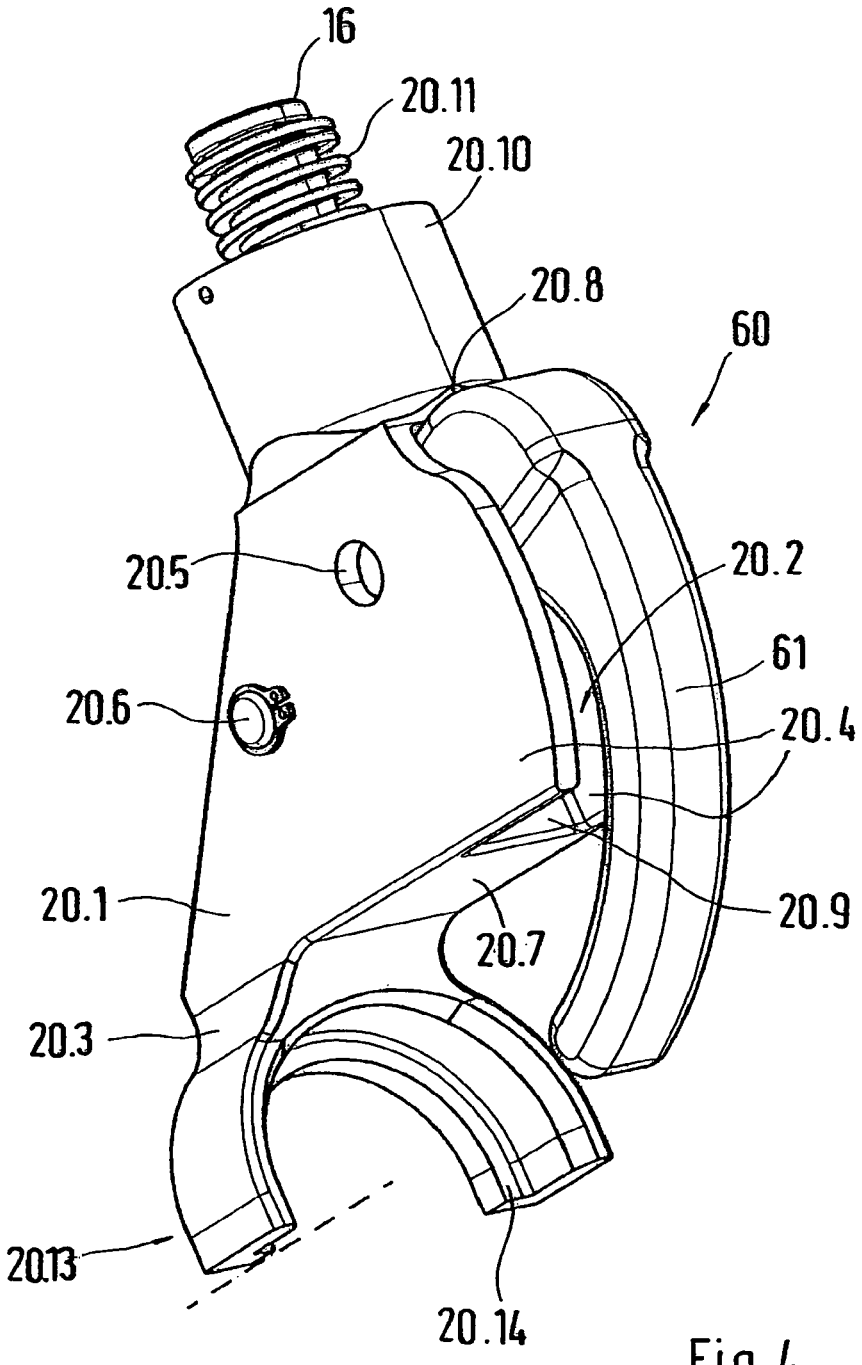

Fig. 4

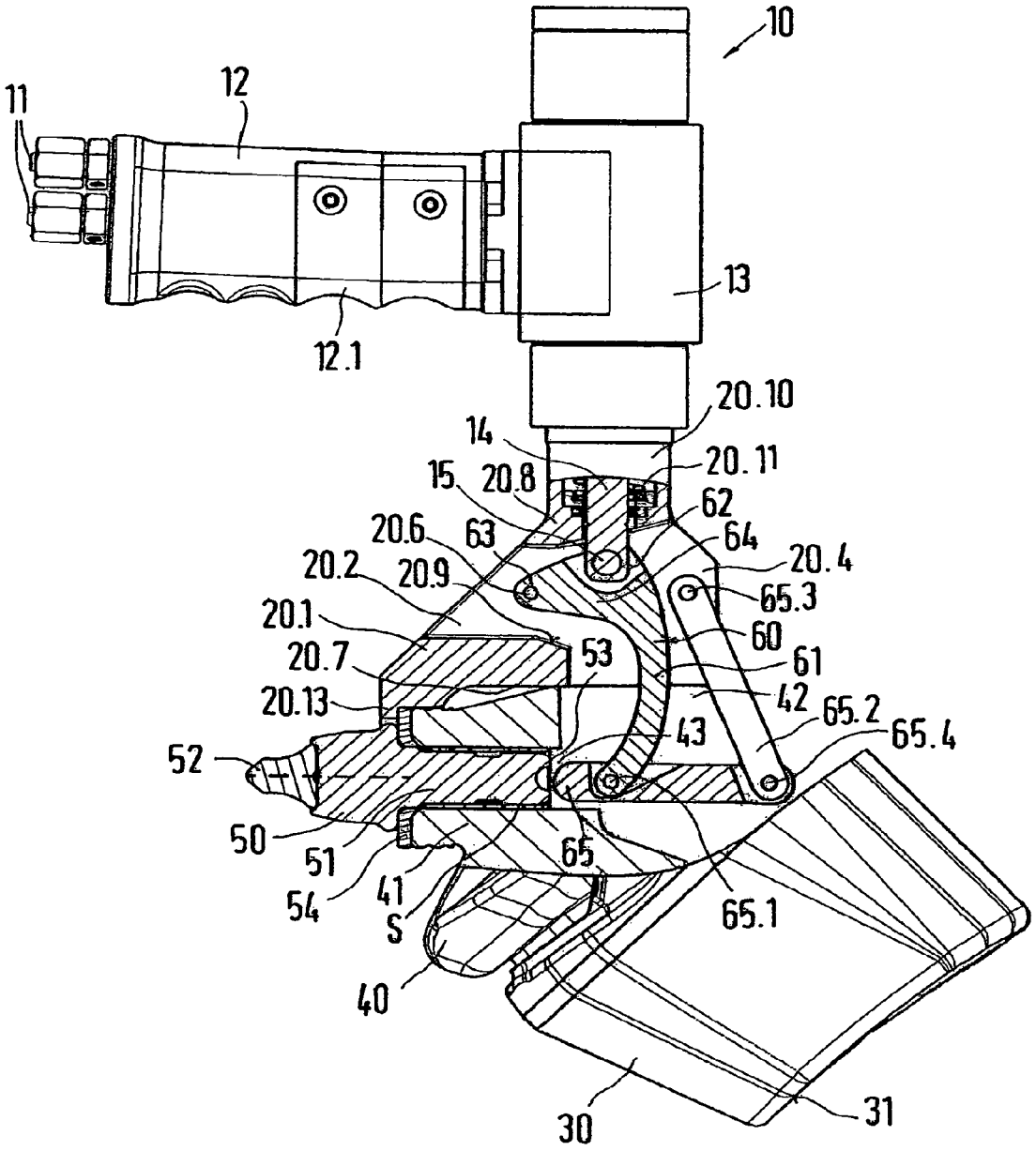
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Fig.5

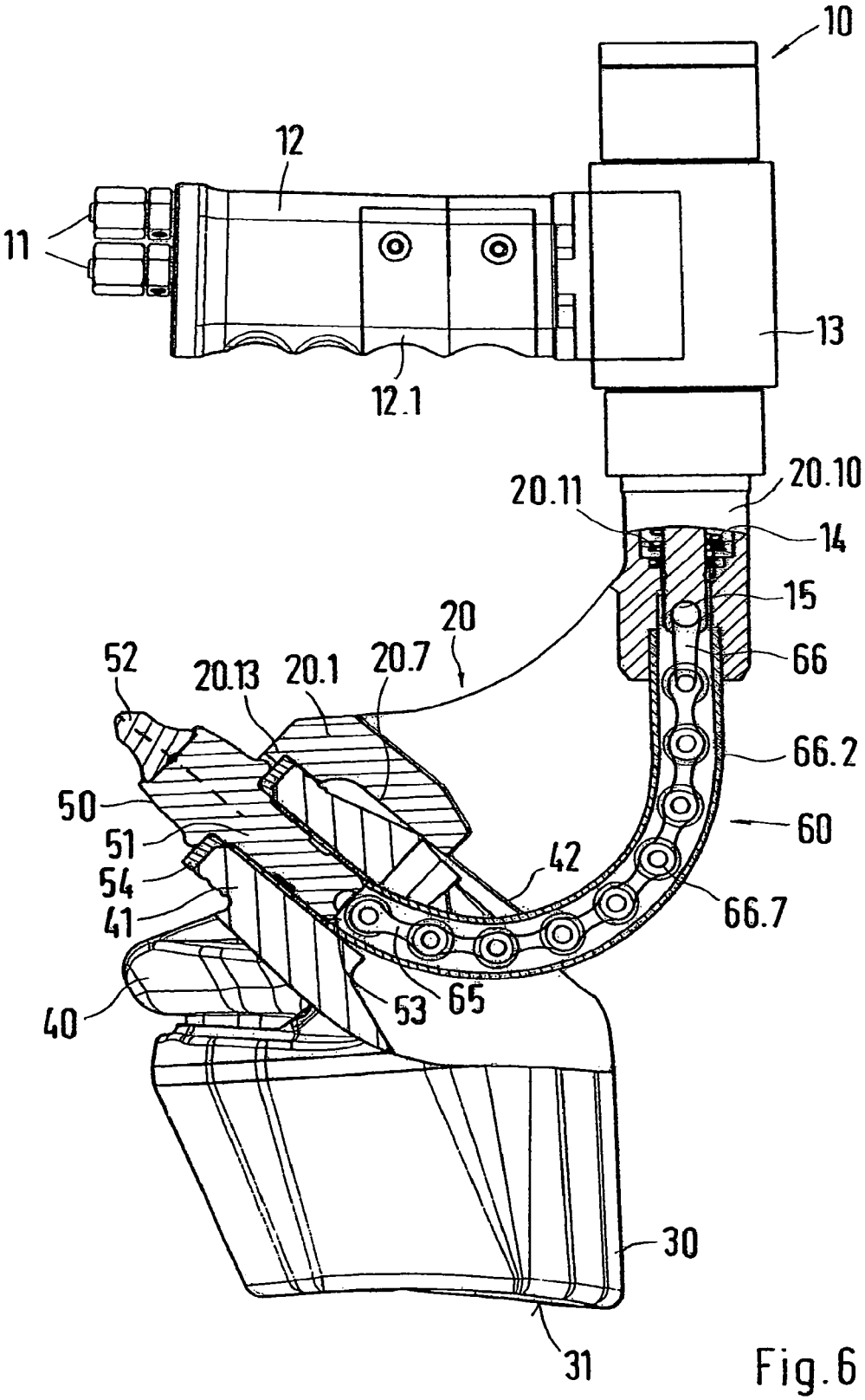
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Fig. 6

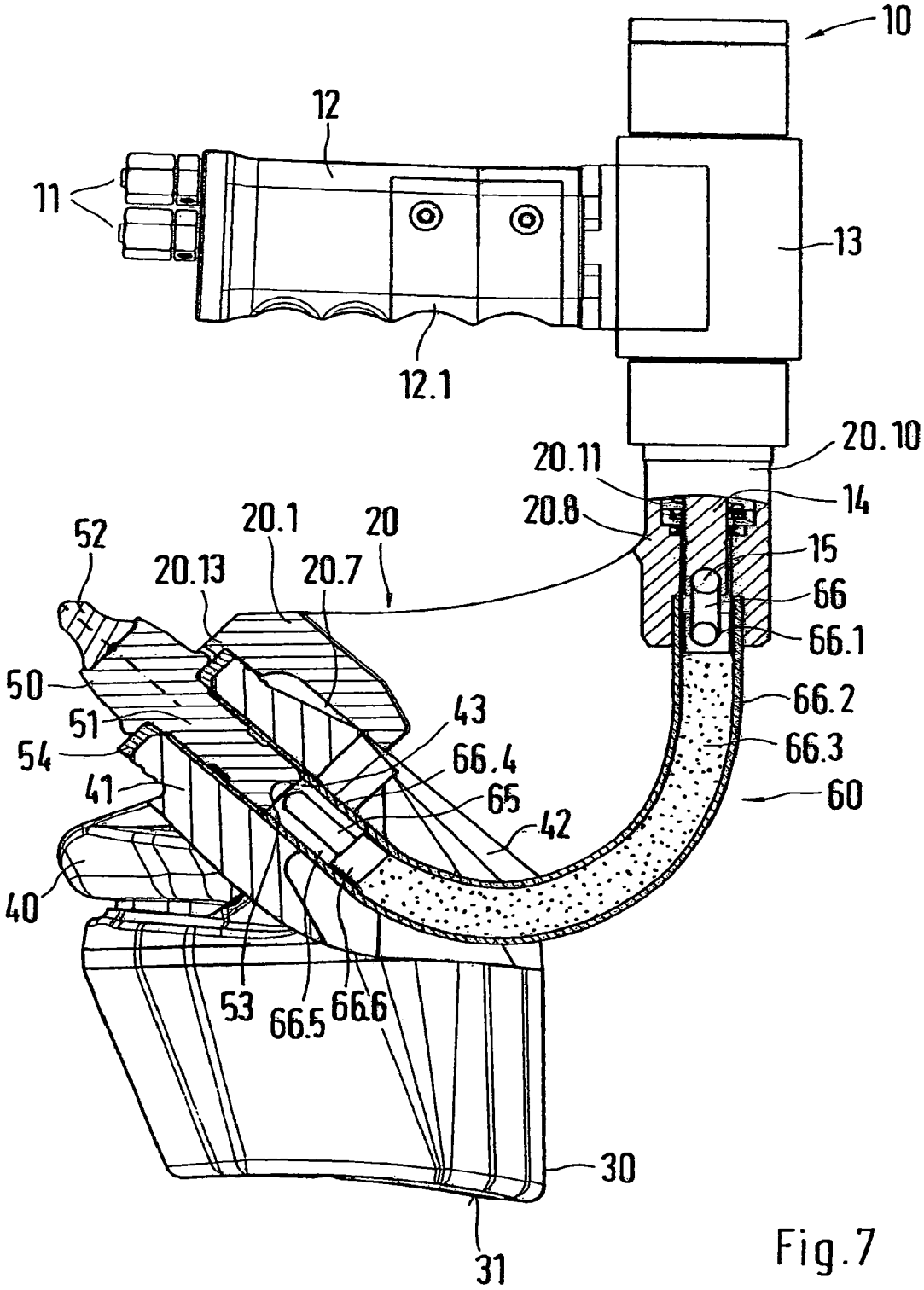
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Fig. 7

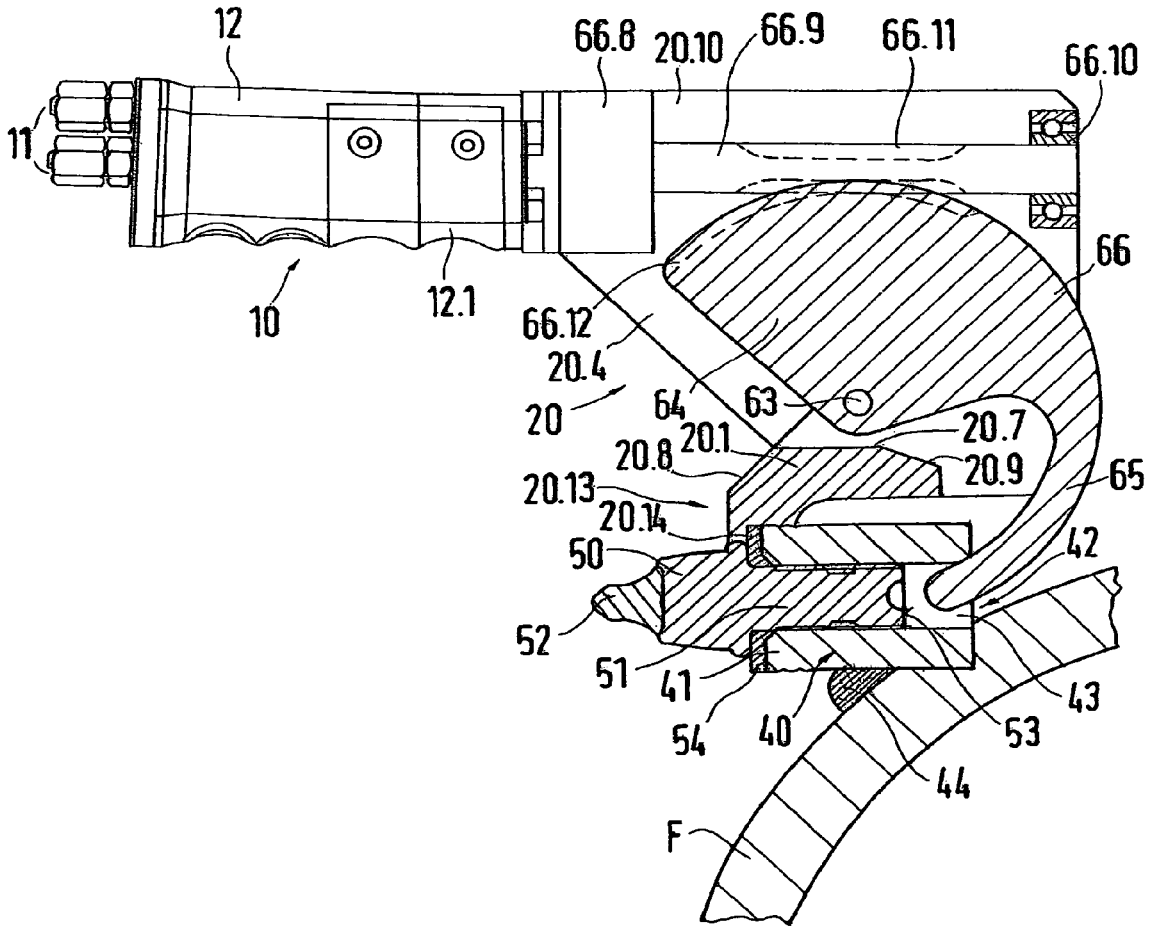
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Fig.8

TOOL FOR REMOVING A CHISEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a tool for removing a chisel, in particular from a chisel holder, having a base element which receives an actuating member, wherein the actuating member has an expeller mandrel, and the actuating member is adjustable.

2. Discussion of Related Art

Similar tools are employed, for example, in connection with road milling machinery, recyclers, surface miners, and the like. They are used for removing chisels, in particular shank chisels, such as round shank chisels. In this case, the chisels are clampingly held in chisel receivers. Customarily, the chisel receivers are designed as through-bores. The chisel holders themselves are fastened to the surface of a milling roller tube, in particular welded to it, or are interchangeably fixed in base supports, which also are welded to the surface of a milling roller tube. Tools are known for making the removal of the chisels easier, such as are described in German Patent Reference DE 296 23 508 U1.

This tool has two lever arms, which are connected with each other by a joint. Here, one of the arms constitutes the expeller mandrel, and the other lever constitutes a handle element. The expeller mandrel can be inserted with its free end into the chisel receiver so that its end contacts the chisel shank of the chisel to be expelled.

The tool can be placed with the second lever against a support shoulder on the milling roller tube. Then, the chisel can be pushed out of the chisel receiver by a lever displacement. Finally, the expeller mandrel is threaded out of the chisel receiver. In the restricted assembly space, the manipulation of the double lever is difficult and is time-consuming. Further, the tool requires a support shoulder on the milling roller, which is not always available.

Removal tools are also known, which can be placed with draw-off claws against the chisel head of the chisel. In this case, a circumferential groove is required in the chisel head, into which the draw-off claws enter. It is not possible to perform a removal of the chisels, if the chisel heads are worn to such a large extent that the groove is no longer sufficiently available. Also, chisels with broken-off chisel heads cannot be removed. Such tools are known from German Patent References DE 43 23 699 C2, DE 32 23 761 A1, and DE 84 03 441 U1 and U.S. Pat. No. 6,526,641 B1.

A further tool is described in German Patent Reference DE 30 26 930 A 1. This tool has a support arm, which can be fixed in place against the chisel holder. A pivot lever, which has a handle, is coupled with the support arm. The chisel holder has a linearly displaceable plunger. For removing the chisel, a pivot arm facing away from the handle is placed against the plunger. As a result of displacing the handle, the plunger can be displaced and the chisel can be pushed out of the chisel receiver by it. The plunger, which is structurally connected with the chisel holder, constitutes an additional part and assembly cost. Further, it requires an increase in the structural space in the chisel holder, which is not always acceptable in connection with modern precision milling machines.

Also, this type of construction requires the fixation of the chisel in a blind hole-like chisel receiver which can become soiled during operation, which leads to a loss of the system.

SUMMARY OF THE INVENTION

It is one object of this invention to provide a tool of the type mentioned above but in which chisels can be simply and rapidly exchanged.

This object is attained in that the actuating member is coupled indirectly or directly to a fluid-charged cylinder-piston system, or to an electric motor-driven unit. For example, the cylinder can be a fluid cylinder, in particular a hydraulic cylinder, which can be charged via an oil circuit. With this it is possible to build up a large pressure on the piston and to transmit correspondingly large forces to the actuating member. Thus it is possible to dependably remove chisels without a large force expenditure. The electric motor driven unit can, for example, be a spindle-nut unit, which can be driven by an electric motor.

In accordance with one embodiment of this invention, the actuating member is seated on the base element, pivotable around a stationary pivot bearing. The base element can be associated with the chisel holder, and a reproducible expelling process can be realized via the stationary pivot bearing.

If, with the displacement movement of the actuating member, the expeller mandrel moves on a curved course, it is possible to realize a varying progression of the moment. For example, with an appropriate layout of the tool it is possible to generate a high moment at the start of the displacement movement, which is then continuously reduced. Thus the condition, at the start of the displacement movement when it is necessary to initially overcome the frictional adherence between the chisel and the chisel receiver, is simply met.

In a preferred manner, the base element has a support section for direct support on the chisel holder, or indirectly on the chisel holder, for example on a wear disk. With the stationary assignment of the tool to the chisel holder it is possible to do without additional support elements, for example an expelling shoulder on the milling roller tube. Thus it is possible to realize a more compact arrangement of the individual chisel holders on the milling roller tube and no additional cost outlay is required, such as with the prior art.

Preferably, those locations on the chisel holder are used for the support, which are not subject to excessive wear, so that the tool can always be placed in a reproducible manner. The wear disk in particular, which is customarily arranged between the chisel head and a support surface of the chisel holder, provides an ideal support location.

For example, the support section can be arranged on a fork-shaped expelling element. The tool can be placed against the chisel holder with the fork-shaped expelling element so that the support section comes to lie on the side of the chisel head of the chisel. There, the support section can engage the wear disk.

In accordance with one embodiment of this invention, distanced from the support section, the base element has an externally located contact face for placement against the chisel holder. It is possible with the support section and the contact face to provide a definite assignment of the tool and the chisel holder. Thus, the tool can always be associated in the same way with the chisel holder.

In one embodiment of this invention, the base element has a receptacle, in which the actuating member is received between two lateral walls which delimit the receptacle, and the lateral walls have seating receptacles in which the actuating member is pivotably seated.

This simple structural design makes possible the stable guidance of the actuating member between the two lateral walls.

In one embodiment of this invention, the displacement movement of the actuating member is limited by at least one stop arranged on the base element. Then the displacement movement of the actuating member can be limited. In this

case, the actuating member can be controlled so that the jamming of the actuating member in its end position is not possible.

In case of an appropriate limitation, the actuating member is positioned by a stop in its initial position so that the easy placement against the chisel holder is possible. The limitation of the actuating movement of the actuating member in the removal position prevents the actuating member from becoming jammed in the chisel receiver.

In particular, the actuating member can be movable out of its initial position into the removal position, and the actuating member can be maintained in a spring-loaded manner in its initial position by a spring element. This step assures that, when the cylinder is switched to no pressure, the actuating member remains in its initial position, or respectively returns into it. For example, in case of the use of a double-acting cylinder, it is possible to do without the spring-loading.

In order to achieve a simple and dependable operation of the tool also in locations which are hard to access, the base element is coupled with a handle element indirectly or directly by a connecting member, and the handle element is pivoted with respect to the base element by a pivot bearing.

In one embodiment of this invention, the expeller mandrel is connected to a lever arm having a coupling for the pivotable connection of the piston rod, and the lever is pivotably seated at a distance from the coupling.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention is explained in greater detail in view of exemplary embodiments represented in the drawings, wherein:

FIG. **1** shows a base support with a chisel holder, to which a tool is assigned, in a first operating position in a lateral view and in partial section;

FIG. **2** shows the representation in accordance with FIG. **1**, in a second operating position;

FIG. **3** shows the representation in accordance with FIG. **1**, in a third operating position;

FIG. **4** shows an adapter of the tool represented in FIG. **1**, in a perspective representation;

FIG. **5** shows the base support and the chisel holder in accordance with FIG. **1** in a lateral view and partial section, in which a further embodiment of the tool is assigned to the chisel holder;

FIG. **6** shows the base support and the chisel holder in accordance with FIG. **1** in a lateral view and in partial section, in which a third embodiment variation of the tool is assigned to the chisel holder;

FIG. **7** shows the base support and the chisel holder in accordance with FIG. **1** in a lateral view and partial section, in which a fourth embodiment of the tool is assigned to the chisel holder;

FIG. **8** shows a milling roller tube with a chisel holder fastened on it in a lateral view and in partial section, in which a fifth embodiment variation of the tool is assigned to the chisel holder.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** shows a tool **10** with a handle **12**. A battery is integrated into the handle **12**. The battery can be charged in an appropriate charging station via two electrical current contacts **11**. The battery is used for supplying electrical current to an electric motor. The electric motor is contained in a housing attachment, which is connected to the handle **12**. A cylinder **13** is contained in this housing attachment. The cylinder **13** can be embodied as a hydraulic cylinder, so that an appropriate hydraulic circuit system is integrated into the housing attachment. A piston is seated in the cylinder **13** and is displaceable between two end positions. A trigger **12.1** is installed on the handle **12**. The trigger **12.1** closes a contact of an electrical circuit and thus activates the electric motor in the housing attachment. The electric motor, together with the hydraulic system, causes the displacement of the piston in the cylinder **13**. Alternatively, it is possible to integrate lines into the handle **12**, which are conducted to fluid connectors on the handle **12**. The fluid connectors are designed as quick-release couplings.

They can be connected to counter-coupling elements of hoses. The hoses can extend, for example, from a hydraulic system of a road milling machine or a surface miner. The lines integrated into the handle **12** are conducted to the cylinder **13**. Also, a piston is housed, linearly displaceable, in the handle **12**. The displacement movement of the piston can be regulated by a valve, which is controllable by a trigger **12.1** on the handle **12**. The adapter **20** represented in FIG. **4** can be connected to the cylinder **13**. This adapter **20** will be explained in greater detail by referring to FIGS. **1** and **4**. It has a base element **20.1**. With two lateral walls **20.4**, the base element **20.1** delimits a receptacle **20.2**. An actuating member **60** in the form of a lever is pivotably seated in this receptacle **20.2**. The actuating member **60** has a lever arm **64**, to which an expeller mandrel **65** is connected in one piece. The expeller mandrel **65** is formed in the shape of a bow. The free end of the expeller mandrel **65** can be convexly crowned. On its end facing away from the expeller mandrel **65**, the lever arm **64** has a bore, which constitutes or forms a seating receptacle **63**.

The seating receptacle **63** is aligned with corresponding bores in the lateral walls **20.4**. A seating bolt **20.6** is pushed through the aligned bores and the seating receptacle **63**, and can be secured by locking rings, as shown in FIG. **4**. The seating bolt **20.6** constitutes or forms a rotary shaft which, in accordance with FIG. **1**, extends vertically with respect to the drawing plane. The lever arm **64** has a coupling **62** in the area between the seating receptacle **63** and the connecting point of the expeller mandrel **65** on the lever arm **64**. A piston rod **14** can be connected by its seating receptacle **15** with the coupling **62**. On its end facing away from the seating receptacle **15**, the piston rod **14** has a collar **16**, as shown in FIG. **4**. A connecting element **20.10** is formed in one piece on the base element **20.1**. FIG. **1** shows that the connecting element **20.10** has a cup-shaped receptacle, which is in a spatial connection with the receptacle **20.2** via a through-bore. A spring element **20.11** is inserted into the cup-shaped receptacle. The spring element **20.11** can be designed as a helical spring. The piston rod **14** is conducted through the helical spring, so that the free end of the piston rod **14** comes into contact with the actuating member **60**.

In the process, the piston rod **14** comes to lie with its seating receptacle **15** against the coupling **62**. In the area of or near the coupling **62**, the lever arm **64** has two bores aligned with each other, which can be aligned with the seating receptacle **15** in the piston rod.

Thus, the collar **16** of the piston rod **14** is placed against the spring end protruding from the cup-shaped receptacle. It is then possible to compress the spring element **20.11** by pressure on the collar **16** until the seating receptacle **15** is aligned with the bores in the coupling **62**. A hinged bolt can be pushed through the aligned bores and the seating receptacle **15**. As FIG. **4** shows, circular passages **20.5** are provided in the lateral walls **20.4**.

With its bores, the lever arm **64** can be aligned with the bores in the coupling **62**. It is then possible to expel the hinged

bolt through the passages **20.5** into the bores of the lever arm **64** and through the seating receptacle **15**. Simple coupling, or respectively uncoupling, of the piston rod **14** can thus be performed. In the coupled state, the piston rod **14** is maintained under spring pre-tension in the position shown in FIG. **1**. Thus, the actuating member **60** is also fixed in this position.

The adapter **20** can be connected with the housing attachment by the connecting element **20.10**. In this case a rotary seating is formed between the connecting element **20.10** and the housing attachment, so that the housing attachment can be rotated with respect to the base element **20.1**. In the mounted state, the piston rod **14** rests with its collar **16** against the piston, which is guided in the cylinder **13**. Here, the piston is arranged in the cylinder **13** in its end position, which defines the expelling position.

As shown in FIG. **1**, stops **20.8** and **20.9** are provided in the area of or near the receptacle **20.1** of the base element **20.1**.

The stops **20.8** and **20.9** are used for limiting the displacement movement of the actuating member **60**. Thus, the actuating member **60** has corresponding end faces, which can be brought into contact with the stops **20.8** and **20.9**. In FIG. **1**, the actuating member **60** rests against the stop **20.8**. In FIG. **3**, the actuating member **60** rests against the stop **20.9**.

As shown in FIG. **4**, an expelling element **20.13** is formed in one piece with the base element **20.1**. The expelling element **20.13** is in a fork shape and has a support section **20.14**.

The tool **10** is used for removing a chisel **50**, which is received in a chisel holder **40**. The chisel holder **40** is exchangeably maintained in a base support **30**.

Thus, the base support **30** has a plug-in receptacle, which receives a plug-in shoulder of the chisel holder **40**. The chisel holder **40** can be fixed in place on the base support **30** by an attachment screw **32**. The base support **30** has a concave support face **31** which can be placed on the surface of a milling roller tube and welded in place on it. The chisel holder **40** has a neck **41**, into which a chisel receiver **43** is cut in the form of a bore. The back of the chisel receptacle **43** is accessible through a cutout **42**. In the present case, the chisel **50** is embodied as a round shank chisel and has a chisel head, on which a chisel shaft **51** is formed in one piece. A clamping sleeve is drawn on the chisel shaft **51**. The clamping sleeve is maintained on the chisel shaft **51** so that it cannot be axially displaced, but is freely rotatable in the circumferential direction. As FIG. **1** shows, the chisel **50** is inserted with its chisel shaft **51** into the chisel receptacle **43** of the chisel holder **40** so that it is clampingly maintained therein by the clamping sleeve. In the inserted state, the chisel **50** is supported through its chisel head on a wear-protection disk **54**, which is drawn on the chisel shaft **51**. The wear-protection disk **54** is arranged between the chisel head and the clamping sleeve. With its side facing away from the chisel head, the wear-protection disk **54** rests against a support face of the chisel holder.

When operationally used, the chisel **50** can rotate with its chisel head on the wear-protection disk **54**. In the process, the chisel shaft **51** also rotates in the clamping sleeve. In the customary manner, the chisel head of the chisel **50** has a chisel tip **52** of a hard alloy, for example.

Once the chisel reaches a worn-out state, it must be removed. Here, the tool **10** described in the drawing figures is used. The tool **10** is then placed on the chisel holder **40**, while the expelling element **20.13** rests with its support section **20.14** on the front of the wear-protection disk **54**. The expelling element **20.13** can also be indirectly or directly supported on a suitable, arbitrary location of the chisel holder **40**.

In the process, a positive connection in the mounting direction of the chisel should be produced between the expelling element **20.13** and the chisel holder **40**. Also, the base element **20.1** has a contact face **20.7**, by which the base element **20.1** is supported on the surface of the chisel holder **40**. It is possible to cause a defined coordination of the tool **10** and the chisel holder **40** by the contact face **20.7** and the support section **20.14**. While placing the tool **10** against the chisel holder **40**, the expeller mandrel **65** also moves through the cutout **42**. In the process, the free end of the expeller mandrel **65** is arranged opposite the free end of the chisel shaft **51**. The free end of the chisel shaft **51** forms a support face **53**. Once the tool **10** is brought into the position shown in FIG. **1**, the trigger **12.1** on the handle **12** can be operated.

With the actuation of the trigger **12.1**, the electric motor in the housing attachment is activated and supplies hydraulic fluid to the cylinder **13**, so that the piston is displaced in the cylinder **13**. Because the piston rests indirectly or directly against the collar **16** of the piston rod, the piston rod is also displaced into the positions shown in FIG. **2**. The spring element **20.11** is also compressed during this displacement movement.

With the displacement of the piston rod **14**, the actuating member **60** is pivoted around its seating receptacle **63**. During this, the actuating member **60** dips with its expeller mandrel **65** into the chisel receptacle **43** so that the free end of the expeller mandrel **65** comes into contact with the support face **53** on the chisel shaft **51**. With the displacement of the actuating member **60**, the chisel **50** is pushed out of the chisel receptacle **43**. During this, the support section **20.14** maintains the wear-protection disk **54** in its position. Accordingly, the clamping sleeve is pushed into the cylindrical bore of the wear-protection disk **54**. During this, the clamping sleeve is compressed radially inward, because of which the clamping effect is partially compensated. Thus a lesser expelling force is required. The actuating movement of the actuating member **60** is limited by the stop **20.9**.

In this final position, a switch also turns off the electrical current supply for the electric motor in the housing attachment. This operating position is shown in FIG. **3**. Here, the chisel **50** is moved completely out of the chisel receptacle **43**. Because power for the electric motor is cut off, the hydraulic pressure is removed from the piston.

The spring element **20.11** can then reduce its pre-tension, so that the actuation member **60** is moved back in a counterclockwise direction into its initial position shown in FIG. **1**. During this, the piston in the cylinder **13** is also moved back into its initial position. The tool **10** can be removed from the chisel holder **40**, so that the wear-protection disk **54** is released. The chisel **50** can be removed.

Tool variations are shown in FIGS. **5** to **8**. In the representations in accordance with FIGS. **5** to **7**, the holder exchange system, including the base support **30**, the chisel holder **40** and the chisel **50**, corresponds to the arrangement in accordance with FIGS. **1** to **4**. FIG. **8** illustrates that the tools **10** in accordance with this invention are not solely restricted to employment with these basically known exchange systems. Rather, an individual case is also possible in which the chisel holder **40** is welded directly on a milling roller tube F, such as shown by the weld seam **44**.

Essentially, the tool embodiment in accordance with FIG. **5** corresponds to the embodiment in accordance with FIGS. **1** to **4**. Only the actuating member **60** is constructed differently. This actuating member **60** is designed as a plane gear in the form of a four-link system, which saves structural space. Two levers **61**, **65.2** are hingedly connected via pivot bearings **65.1**, **65.4** to an expeller mandrel **65**. In this case, the pivot axes are oriented perpendicularly with respect to the drawing plane.

Facing away from the expeller mandrel **65**, the lever **61** is connected to the piston rod **14** via a pivot bearing, such as the seating bolt **20.6**. This connecting area corresponds to the connecting area of the piston rod **14** to the actuating member **60** in accordance with FIGS. **1** to **4**. Reference is made to the above explanations.

On an end facing away from the expeller mandrel **65**, the second lever is connected to the lateral walls **20.4** by a pivot bearing **65**. Again, the pivot axes are oriented perpendicularly with respect to the drawing plane. FIG. **5** shows the initial position of the tool. When actuating the trigger **12.1**, the piston rod **14** is displaced linearly downward in the drawing plane. In the process, the levers **61** and **65.2**, which are connected via the expeller mandrel **65**, are synchronously pivoted in a clockwise direction. The expeller mandrel **65** simultaneously enters into the chisel receptacle **43** and pushes the chisel **50** on its support face **53** out of the chisel receptacle **43** while overcoming the clamping force of the clamping sleeve S.

After reaching the expelling position, the spring element **20.11** pushes the actuating member **60** back into the initial position shown in FIG. **5**.

FIG. **6** shows a further tool embodiment, in which the adapter **20** again essentially corresponds to the adapters **20** in accordance with FIGS. **1** to **5**. Thus, only the different characteristics are addressed, and reference is otherwise made to the above explanations. The connecting element **20.10** of the adapter **20** has a receptacle, into which a bent tube **66.2** is inserted and is held there. An element **66.7** of low flexural strength, in this case a link chain, such as is also used in principle in propulsion technology, is inserted into the tube **66.2**. With its one end, the link chain is pivotably fastened to the seating receptacle **15** of the piston rod **14**. At the other chain end, the last chain link constitutes or forms the expeller mandrel **65**. FIG. **6** again shows the initial tool position. When actuating the trigger **12.1**, the piston rod **14** is displaced, such as downward. In the process, it enters into a cylindrical connecting area of the tube **66.2**.

The link chain is displaced in the tube **66.2**, and in the process the tube **66.2** prevents the link chain from kinking. The expeller mandrel **65** is supported on the support face **53** of the chisel **50** and pushes it out of the chisel receptacle **43**.

Once the link chain reaches the area of the chisel receptacle **43**, the latter prevents it from kinking. After reaching the end position, the spring element **20.11** places the actuating member **60** back into its initial position shown in FIG. **6**.

In the tool in accordance with FIG. **7**, the tube **66.2** is preferably filled with a fluid **66.3** in place of the link chain. A piston **66.1** is connected to the piston rod **14** by a crosshead link. With its exterior contours, the piston **66.1** provides a seal on the interior wall of the cylindrical area of the tube **66.2** with the aid of a seal ring. A second piston **66.1** is sealingly seated at the other tube end, which is also cylindrically embodied. The piston **66.1** can be linearly displaced and supports the expeller mandrel **65**. The tube **66.2** can enter into the chisel receptacle **43** through the cutout **42**, so that the expeller mandrel **65** lies opposite the support face **53** of the chisel **65**. During displacement of the piston rod **14**, the piston **66.1** is pushed into the tube **66.6**. The fluid **66.3** transmits this actuating movement to the second piston **66.6**. In the process, the expeller mandrel **65** pushes the chisel **50** out of the chisel receptacle **43**. During relief of the piston rod **14**, the spring element **20.11** pushes the actuating member **60** into the initial position. The piston **66.1** is thus pulled upward. With the creation of a vacuum, the second piston **66.6** is also aspirated back into its initial position by the fluid **66.3**.

In FIG. **8**, a tool **10** is shown, in which an electric motor **66.8** is integrated into the handle **12**. The output shaft **66.9** of the electric motor **66.8** has a spindle **66.11**. Facing away from the electric motor **66.8**, the output shaft **66.9** is rotatably fixed in place by a ball bearing **66.10**. Also, the actuating member **60** is received in the adapter **20** between the two lateral walls **20.4** and in the present case has the shape of a disk. The edge of the actuating member **60** has a tooth arrangement **66.12**, which meshes with the spindle **66.11**.

The actuating member **60** is held in the adapter **20**, and the seating receptacle **63** constitutes or forms the pivot axis. The actuating member **60** supports the expeller mandrel **65**, which is formed as one part of, and eccentrically with respect to, the seating receptacle **63**.

Again, the tool **10** can be inserted with the expeller mandrel **65** through the cutout **42** into the chisel receptacle **43**, so that the expeller mandrel **65** lies opposite the support face **53** of the chisel **50**. When actuating the trigger **12.1** on the handle **12**, the electric motor **66.8** is activated. Thus, the output shaft **66.9** is set into rotary motion. Via the tooth arrangement **66.12**, the spindle **66.11** turns the actuating member **60** in a clockwise direction. A sufficiently large lever arm is formed by the spacing of the tooth arrangement **66.12** with respect to the pivot bearing **63**. A large force reduction is made possible by employing the spindle gear. Upon a rotation of the actuating member **60**, the expeller mandrel **65** pushes the chisel **50** out of the chisel receptacle **43**. After reaching the push-out position, the electric motor **66.8** changes directions and changes the direction of rotation until the actuating member **60** again reaches an end position shown in FIG. **8**. The electric motor **66.8** is then switched off in this position.

It is understood that the described tool **10** can also be employed in connection with the most diverse, suitable chisel holders **40** and holder exchange systems.

German Patent Reference 10 2008 025 071.6-15, filed 26 May 2008, the priority document corresponding to this invention, to which a foreign priority benefit is claimed under Title 35, United States Code, Section 119, and its entire teachings are incorporated, by reference, into this specification.

What is claimed is:

1. A tool for removing a chisel from a chisel holder, comprising:

a fork-shaped base element including first and second elongated base element portions separated by a space, the base element including a base element support surface defined on the first and second elongated base element portions and facing in a first direction and configured to support the base element directly or indirectly against the chisel holder, the base element and the first and second elongated base element portions being formed in one piece;

an actuating member pivotally connected to the base element, the actuating member being pivotable relative to the base element from an initial position, in a direction opposite the first direction and toward the space between the first and second elongated base element portions to a removal position to remove the chisel from the chisel holder the actuating member having a distal end arranged to move on a path aimed between the first and second elongated base element portions as the actuating member moves from the initial position toward the removal position; and

a power source including a cylinder-piston system or an electric motor unit mounted on the base element and operably associated with the actuating member to move the actuating member between the initial position and the removal position.

2. The tool of claim 1, wherein the base element includes a stop face spaced apart from the base element support surface, the stop face being configured for placement against the chisel holder.

3. A tool for removing a chisel from a chisel holder, comprising:

a base element including a base element support surface configured to support the base element directly or indirectly against the chisel holder;

an actuating member pivotally connected to the base element, the actuating member being pivotable relative to the base element from an initial position to a removal position to remove the chisel from the chisel holder; and

a power source mounted on the base element and operably associated with the actuating member to move the actuating member between the initial position and the removal position;

wherein the base element includes at least one stop surface defined on the base element and configured to abut the actuating member to limit movement of the actuating member.

4. The tool of claim 1, further comprising:

a spring element biasing the actuating member toward the initial position.

5. The tool of claim 1, further comprising:

a handle attached to the base element.

6. A tool for removing a chisel from a chisel holder, the chisel holder having a holder support surface, the tool comprising:

a fork-shaped base element configured to engage the holder support surface of the chisel holder, the fork-shaped base element including first and second elongated base element portions separated by a space, the base element and the first and second elongated base element portions being formed in one piece;

an actuating member pivotally connected to the base element, the actuating member being configured such that a distal end of the actuating member pivots toward the space between the first and second elongated base element portions to engage the chisel when the base element is engaged with the holder support surface; and

a powered actuator drive including a cylinder-piston system or an electric motor unit coupled to the actuating member for pivoting the actuating member relative to the base element to expel the chisel from the chisel holder.

7. The tool of claim 6, wherein the base element includes a stop face spaced apart from the base element support surface, the stop face being configured for placement against the chisel holder.

8. A tool for removing a chisel from a chisel holder, the chisel holder having a holder support surface, the tool comprising:

a base element configured to engage the holder support surface of the chisel holder;

an actuating member pivotally connected to the base element, the actuating member being configured to engage the chisel when the base element is engaged with the holder support surface; and

an actuator drive coupled to the actuating member for pivoting the actuating member relative to the base element to expel the chisel from the chisel holder;

wherein the base element includes at least one stop surface defined on the base element and configured to abut the actuating member to limit movement of the actuating member.

9. The tool of claim 6, wherein:

the actuating member is movable between an initial position and a removal position; and

further comprising a spring element biasing the actuating member toward the initial position.

10. The tool of claim 6, further comprising:

a handle attached to the base element.

11. A tool for removing a chisel from a chisel holder, comprising:

a fork-shaped base element having first and second elongated base element portions separated by a space, the base element including a base element support surface defined on the first and second elongated base element portions and facing in a first direction and configured to support the base element directly or indirectly against the chisel holder, the base element and the first and second elongated base element portions being formed in one piece;

an actuating member mounted on the base element, the actuating member having a distal end movable relative to the base element from an initial position toward the space between the first and second elongated base element portions to a removal position to remove the chisel from the chisel holder; and

a power source including a cylinder-piston s stem or an electric motor unit mounted a on the base element and operably associated with the actuating member to move the actuating member between the initial position and the removal position.

12. The tool of claim 11, wherein the base element includes a stop face spaced apart from the base element support surface, the stop face being configured for placement against the chisel holder.

13. A tool for removing a chisel from a chisel holder, comprising:

a fork-shaped base element including a base element support surface configured to support the base element directly or indirectly against the chisel holder;

an actuating member mounted on the base element, the actuating member being movable relative to the base element from an initial position to a removal position to remove the chisel from the chisel holder; and

a power source mounted on the base element and operably associated with the actuating member to move the actuating member between the initial position and the removal position;

wherein the base element includes at least one stop surface defined on the base element and configured to abut the actuating member to limit movement of the actuating member.

14. The tool of claim 11, further comprising:

a spring element biasing the actuating member toward the initial position.

15. The tool of claim 11, further comprising:

a handle attached to the base element.

16. A tool for removing a chisel from a chisel holder, the chisel holder having a holder support surface, the tool comprising:

a fork-shaped base element including first and second elongated base element portions separated by a space, the base element including a base element support surface defined on the first and second elongated base element portions and facing in a first direction and configured to engage the holder support surface of the chisel holder, the base element and the first and second elongated base element portions being formed in one piece;

an actuating member movable relative to the base element, the actuating member having a distal end arranged to move on a path aimed between the first and second elongated base element portions as the actuating member moves from an initial position toward a removal position to engage the chisel when the base element is engaged with the support surface; and

a powered actuator drive including a cylinder-piston system or an electric motor unit coupled to the actuating member for moving the actuating member relative to the base element from the initial position to the removal position to expel the chisel from the chisel holder.

17. The tool of claim **16**, wherein the base element includes a stop face spaced apart from the base element support surface, the stop face being configured for placement against the chisel holder.

18. A tool for removing a chisel from a chisel holder, the chisel holder having a holder support surface, the tool comprising:

a fork-shaped base element configured to engage the holder support surface of the chisel holder;

an actuating member movable relative to the base element, the actuating member being configured to engage the chisel when the base element is engaged with the support surface; and

an actuator drive coupled to the actuating member for moving the actuating member relative to the base element to expel the chisel from the chisel holder;

wherein the base element includes at least one stop surface defined on the base element and configured to abut the actuating member to limit movement of the actuating member.

19. The tool of claim **16**, further comprising:

a spring element biasing the actuating member toward the initial position.

20. The tool of claim **16**, further comprising:

a handle attached to the base element.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,157,320 B2
APPLICATION NO. : 13/611735
DATED : October 13, 2015
INVENTOR(S) : Lehnert et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

IN THE CLAIMS:

In column 8, line 58, insert --,-- after "holder";

In column 10, line 26, replace "s stem" with --system--.

Signed and Sealed this
Twenty-seventh Day of September, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office